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CITATION:

SHIKANO, Kazuhiro. On the Stability of the Goat Herd in the Pastoral Samburu. African study monographs. Supplementary issue 1984, 3: 59-69

ISSUE DATE:

1984-03

URL:

<https://doi.org/10.14989/68321>

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On the Stability of the Goat Herd in the Pastoral Samburu

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ABSTRACT

The domestic goat herds maintained by the Samburu, nomadic pastoralists living in northern Kenya, are observed from a socio-ecological point of view. This study attempts to examine the characteristics of the domestic goat herd and to discuss its origin.

Firstly, the interaction between man and goats in day-trip herding is described, and it is conjectured that there is some kind of cohesiveness between individuals within the herd. This is confirmed by the observations of group oriented behavior; stray goats autonomously going back to the herd without human management. These observations show that primarily goats gather in herds and herders assist goats in gathering together.

Secondly, two examples of inter-herd relations show that goats distinguish their own herd from another and have a tendency to keep in contact with their own herd. The herd is thus discernible during inter-herd encounters. Therefore it is concluded that the domestic goat herd is a sociologically stable unit, a discernible congregation with constant membership.

The feral goats of Chichijima, however, does not form a stable group, and it is highly probable that the wild goat does not form one either. All these factors suggest and support the hypothesis that, the stable domestic goat herd was formed with the influence of man during the process of domestication.

INTRODUCTION

The origin of nomadic pastoralism is closely related to the origin of pastoral domestic animals (Imanishi, 1948). Therefore we cannot clearly explain the former without understanding the latter. And since pastoral domestic animals are characterized as domestic animals forming herds, the problem of how the herd of domestic animals is organized and how it was formed must become an issue.

To the knowledge of the author, Imanishi (1948) and Umesao (1965) were the first researchers to look at the origin of nomadic pastoralism taking into consideration the formation of the herd. From a socio-ecological perspective, using the work of Hatt (1919) on the domestication of reindeer, they hypothesized that before domestication, these animals lived in groups much like the troop or one-male group in primates. Thus, pastoral domestic animals originated when man began to control and consequently domesticate entire groups of animals at once.

Since then, Tani (1976, 1979, 1982) on sheep and Ohta (1982) on goats are probably the only researchers to investigate this problem from a socio-ecological perspective. Ohta in particular has discussed the behavioral

modification of the domestic goat by the Turkana of East Africa. However, the meaning of behavioral modification in the context of the origin of nomadic pastoralism has not been dealt with in the literature.

It is the purpose of this paper to discuss the formation of the herd in pastoral domestic animals. The characteristics of Samburu goat herds are analysed. These results are compared with results from the author's observation of feral goats on Chichijima in the Ogasawara archipelago of Japan. Goats were selected as study subjects because they are the oldest pastoral domestic animals (Zeuner, 1963). In understanding the formation of the domestic goat herd, we can begin to understand the origin of nomadic pastoralism.

MATERIALS AND METHOD

The Samburu are pastoralists living in the Samburu District of northern Kenya (Fig. 1). The region is composed of two major vegetation types; semi-desert and comparatively moist vegetation. The mountains around Maralal (the administrative center of the district) in the southwestern portion of this district are vegetated by highland forest species. The area surrounding these mountains is all grassland. The remaining portion of the district lies mostly below 1,500 meters and is all semi-desert. The research was conducted at Raraiti (Fig. 2), an area approximately 40 kilometers northeast of Maralal. The vegetation of this area is semi-desert and is composed of scarcely distributed trees of the genera *Commiphora* and *Acacia*. The dry and rainy seasons are greatly contrasted, with rainfall limited to the periods between March thru May and October thru December. The average annual rainfall for Baragoi (approximately 80 kilometers north of Raraiti) between 1977 and 1982 was 520 mm. The study period was from July 1982 to February 1983.

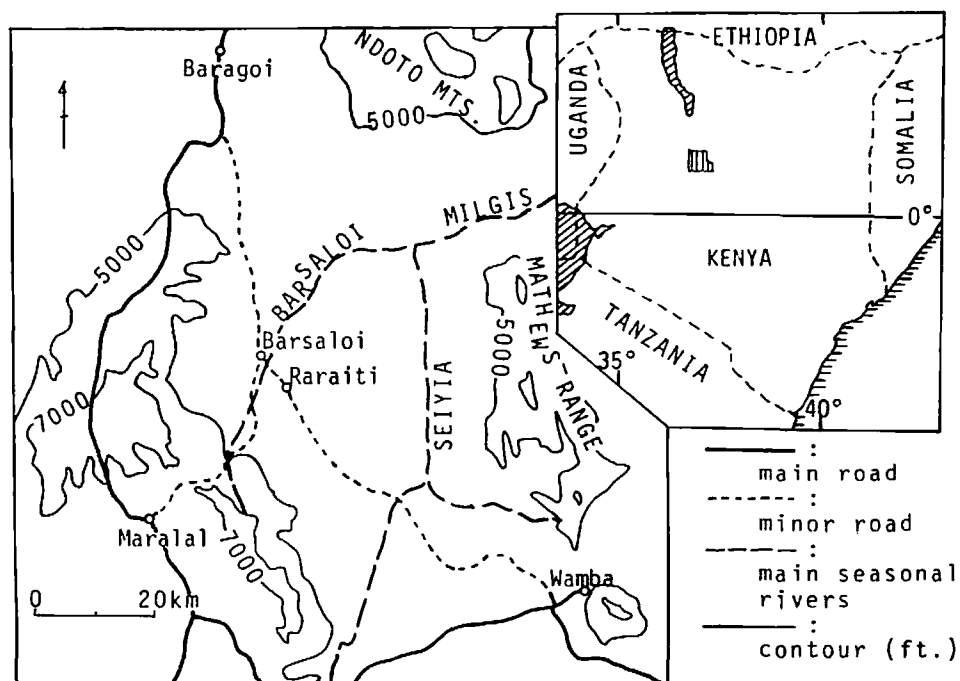


Fig. 1. Study area

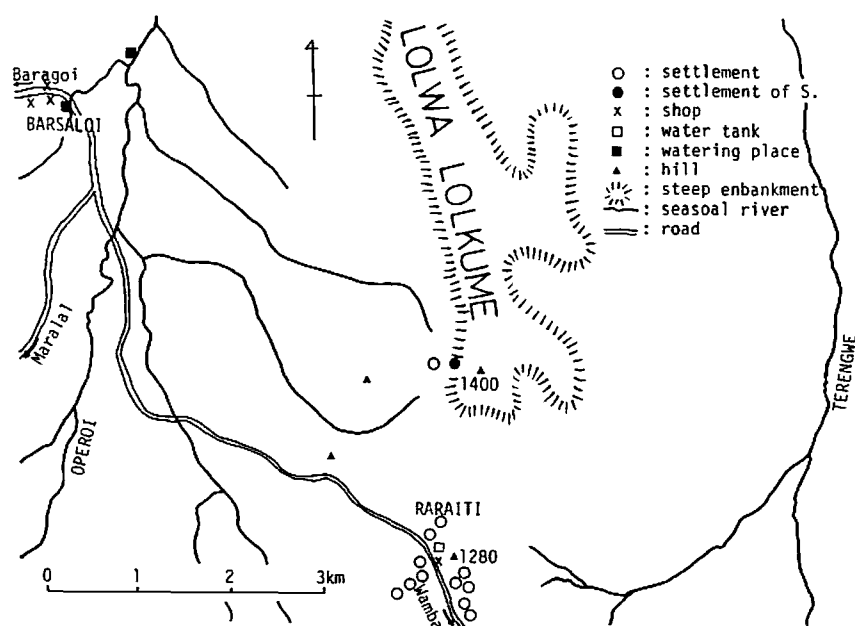


Fig. 2. Map of Raraiti Region

The language spoken by the Samburu belongs to the Eastern-Nilotic (Gregersen, 1977). This language is very similar to the Maasai language. According to the 1969 population census of the Samburu, there were approximately 25,000 people. According to Umesao's (1965) classification of pastoralist types, the Samburu are savanna cattle pastoralists. For the Samburu, cattle are their most prized property. During the dry season, however, the cattle herds are taken great distances from the settlement for grazing and water. At this time they become almost entirely dependent on the milk and meat of the goat and sheep herds left behind. Thus although goat and sheep are small livestock, they are the supporting base of Samburu subsistence. Donkeys are also kept, and used as pack animals. Recently some people have even begun to keep camels. Although corn meal, sold at local market places, is an important staple in their diet, agriculture was not practiced in Raraiti region.

The settlement area is surrounded by a 2-3 meter high fence constructed of *Acacia* and *Commiphora* branches (Fig. 3). The average settlement is composed of four independent families living in six or seven huts (Spencer, 1973). At Raraiti there is a rainwater tank constructed by the local Catholic Mission. There are over ten settlements located in the vicinity. In each settlement the goats and sheep are put together into the same family kraal each night and managed as one unit during day-trip herding. The family kraals are located in the center of the settlement and the family huts are distributed around these kraals. Cattle are moved into the remaining area inside the settlement enclosure where they too spend the night. Donkeys and

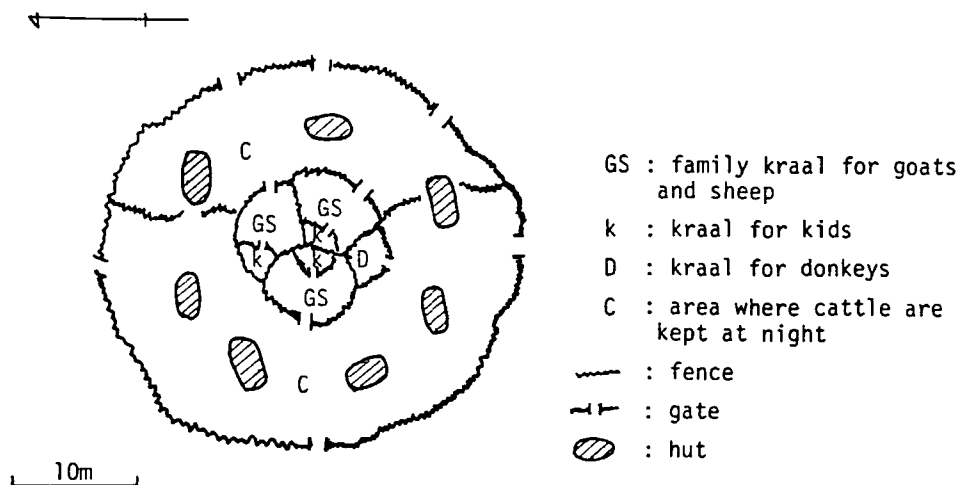


Fig. 3. A typical Samburu Settlement

camels are penned separately in family kraals also in the center of the settlement. The location of the settlement is changed several times throughout the year, but the moves are usually not very far.

The subjects of this study were two mixed herds of goat and sheep and are referred to as S-herd and J-herd respectively, after the first initial of the owner of each herd. The owner of S-herd lived approximately 2 km southwest of Raraiti at the foot of Turkana hill (lolwa lolkume). In his settlement there were 5 families, living in 7 huts. The settlement consisted of 18 people. The owner of J-herd lived in Raraiti with his wife and 2 children. J-herd was kept in S's settlement under the care of J's wife's sister. At night, S-, and J-herd were put into separate kraals, but were frequently herded together in the same area by separate herders in the daytime. S-herd contained 55 animals and J-herd 76. The age-sex composition of each herd is given in Table 1. Compared with other herds in the study area, these two herds were of average size (Table 2). As mentioned above, goats and sheep were maintained together as a single herd. However, the number of sheep was insufficient for study purposes, therefore sheep were omitted from this investigation. S-, and J-herd will be referred to as goat herds in this paper.

The author followed the herd daily. Information was collected by inquiry, and direct observation of the herd. All members of both herds were individually identified.

DAY-TRIP HERDING OF THE SAMBURU

For herding purposes a goat herd is split up into two separate groups according to age. There is a kid group and an adult group. Up until 6 months of age, members of the kid group remain near the settlement separate from the adult group, without the supervision of an assigned herder. Inside each individual family goat kraal, the kid group is placed within a smaller

Table 1. Age-sex composition of S and J herd

Age-sex Category	S-herd		J-herd	
	Goat	Sheep	Goat	Sheep
Reproducing Male	1	0	2	1
Castrated Male	4	0	2	0
Young Male	8	2	15	2
Infant Male	3	2	3	1
Parous Female	17	6	24	5
Nulliparous Female	8	1	11	4
Infant Female	3	0	5	1
Subtotal	44	11	62	14
Total	55		76	

Table 2. Population size of small stock herds in study area

Herd Name	Goat	Sheep	Total
J.	62	14	76
S.	44*	11	55*
Lem.	100	10	110
Lep.	59	2	61
Let.	8	0	8
Ltp.	173	33	206
Low.	54	15	69
Lyd.	47	15	62
Lym.	12	0	12
Lyn.	13	7	20
Nap.	11	3	14
Nas.	30	6	36
Nir.	27	4	31

*: Approximate number

enclosure (lambs are allowed to sleep with their mothers.). After the first three months, kids are frequently mixed in with the adult group and herded together. During this period, if the mother is milked in the morning, the kid is allowed to go with her into the adult group. If the mother is not milked until mid-day the kid is not allowed to enter the adult group until this time. After approximately 6 months, kids are weaned. At this point they are permanently put in the adult group. Not including these kids, the adult group consists of; reproducing males, castrated males, young males, parous females, and nulliparous females. The adult group can range in size from 10 to 200 individuals (Table 2), but regardless of size, there is usually one herder per group. S-herd was usually herded by a 13 year old girl and J-herd by an 18 year old girl.

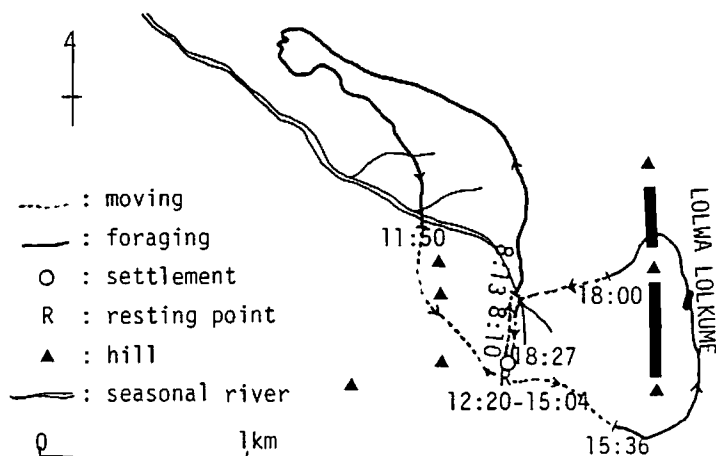


Fig. 4. An example of Day-Trip Herding (26 Jan. 1983).

A typical day herding trip followed a cyclic pattern of; movement, feeding, movement, and rest (Fig. 4). This pattern was repeated twice daily. In other words, the herd (the adult group will be referred to as herd from this point on) is taken away from the settlement at about 8:00 and herded to the morning feeding area, where they feed throughout the morning. At around 12:00, the herd is returned to the settlement. Here the goats rest until around 15:00, when they are taken out to feed. At around 18:00, before sunset, the herd is herded back to the settlement for the night. The herd is taken farther away from the settlement during the morning. Except for during the driest season, when the herd must be herded farthest from the settlement to find a suitable feeding site, the herd is brought back and allowed to rest just outside of the settlement in the shade of an established "resting tree". During the rainy season, since there is plenty of moisture and thus abundant vegetation nearby it is not necessary to travel far from the settlement. Also, moisture which has collected on the ground can cause foot-rot in livestock, so the herders wait until after 9:00 when the ground has had a chance to dry off, before leaving the settlement. On the other hand, as mentioned above, during the dry season the herd must be taken farther away from the settlement to find food, thus the morning departure time was usually around 7:30. During the rainy season, the round-trip herding distance was approximately 6 km and during the dry season approximately 10 km.

The watering time for the herd varied according to season. During the rainy season there was none. During the driest part of the dry season, the herd was watered every three days. Usually, however, during the beginning of the dry season they were watered every seven days. If rain should fall during the dry season, a well was dug in the semi-permanent stream bed and the goats were watered there. When such water was not available, the herd was moved 6 km northwest to the Barsaloi river (Fig. 2), taking a full day both ways. Even during the driest part of the season water was available there. The soil in this area contained traces of salt and was utilized by the goats at the same time.

STABILITY OF THE GOAT HERD

In this section it shall be made clear through examples, important characteristics of the domestic goat herd. First, how the herd unity is maintained is examined through the description of the man-goat interaction in the day-trip herding. The following description was the product of the author's assisting the herder.

When the herd was released from the family kraal they would move outside of the settlement area. The herder initiated movement by whistling, calling out "hai", and hitting the ground or nearby goat with a branch whip. Once moving, the goats walked in pairs or trios forming a loose procession. The herder stayed towards the rear driving them on, calling out and occasionally striking out at an animal or the ground. When the herder reached a suitable feeding site he would stop driving the herd and they would naturally slow down and spread out to feed.

While feeding, the goats move slowly ahead. The herder's main job was to change the direction of small groups of goats straying off in separate directions, and to change the direction of the entire herd. In order to keep the herd together the herder would drive small groups which moved away back to the main herd. To accomplish this the herder would throw sticks or stones out in front of them. Once the goats changed directions and started to return, they would rejoin the herd without further trouble. Sometimes just by calling out "hai", these small groups would return to the herd. The herder frequently changed or directed the movement of the entire herd, driving it back and forth over the same area slowly, making sure that the goats ate as much as possible. To change the direction of the herd it was only necessary for the herder to direct those individuals at the front. The individuals moving behind would autonomously follow those in front of them.

In order to gather the herd together and return to the settlement, the herder would move around the outside of the group calling out and waving the branch whip. The goats would respond by gathering together in a tight group. When the herd returned to the settlement, the herder would stop driving the animals at point about 10 m from the "resting tree". The herd would naturally gather in the shade and rest standing or sitting down closely together. During this resting period the herder left them alone.

Resting until around 15:00, the goats would become restless and start to move off. Usually somebody from the settlement would notice this and call to the herder. When nobody paid attention and the herd took off, they would move out by themselves. Almost all of the members of the owner's family in the settlement would go out searching for the lost goats. The goats are unable to control the speed of herd movement and thus, if individuals at the front of the herd should start to run ahead, the followers would also speed up and the herd would run away. In all situations, to slow down the herd or to stop it, calling out "hai" or "arri", the herder would move out in front of the herd and turn back the individuals at the front. Then the goats would begin feeding again.

Some of the above observations can possibly be explained by Baskin's (1974) defensive response. For example when the herder drives small group back to the main herd, or when attempting to tighten up the herd to take them back to the settlement. However, there are instances in which it is not possible to explain the goats' behavior in terms of defensive response behavior. For example, the case when the direction of the entire herd is being changed and the individuals behind follow spontaneously the movements of those in front of them. Also, when stragglers attempt to keep up with the "run away" herd, consequently perpetuate the herd's speed of travel. Or when the herd is allowed to rest, the goats naturally congregate close together. None of these instances can be explained as a response to dangerous or threatening situations. In order to understand the behavior of the goats in

these cases it must be accepted that there is some kind of cohesiveness between individuals within the herd.

The following field observations will show the cohesiveness of the domestic goat herd. When an individual became separated from the rest of the herd for some reason, raising its stiffened neck and assuming the "alarm posture" (Shank, 1972), the goat while bleating either walks stiff leggedly or runs toward the herd. The author defines this kind of behavior as group oriented behavior.

Observation 1. 27 Aug. 1982, 12:01. Just after the morning feeding on the return trip back to the settlement, a female from Lem's-herd suddenly stops and starts to give birth. The herder of this group notices what is going on and runs over to help remove the new-born kid from the mother. He then puts the infant up to the mother's nose and rubs some of the birth fluid on her face. Flehmen is observed several times in the mother. During this period the herd progresses forward. The mother frequently looks toward the herd bleating and attempts to follow. The herder grabs the mother's front leg preventing her from leaving and holds the infant up to her face. 12:05. The mother begins to lick her infant. 12:10. The herder releases the mother and she runs toward the herd bleating. The herder takes the infant under his arm and follows after the herd.

The preceding example describes the group oriented behavior of one individual but there are examples of several individuals in a small group exhibiting the same behavior.

Observation 2. 27 Jan. 1983, 11:10. S-herd is feeding on a slope. 11:16. An infant and its mother (they belong to S-herd) are resting in a spot away from the herd. The infant has been injured and cannot see from one eye. 11:18. The herder approaches the two individuals and raises up his arms up and down in an attempt to drive them back to the herd. The infant however run in the opposite direction away from the herd. (The author believes that the infant ran in the opposite directions for reasons related to its injury. This was the only instance in which a goat ran away from the direction of the herd when approached in this manner by a herder.) Bleating the mother follows after the infant. 11:20. The pair stop under a tree about 100 m from the herd. They both repeatedly bleat out towards the herd. 11:26. Occasionally another herder passes by and attempts to drive the two goats with his herd toward S-herd. The mother and infant continually cry out. 11:28. The herder from S-herd approaches the two individuals and drives them back to the herd, arriving at 11:32.

Observation 3. 6 Dec. 1982, 8:29. The herders of S-, and J-herd are driving their herds out in the same direction. 9:58. The light rain stops and the two herds spread out feeding together in one large group. 10:05. A group of 25 goats move away from the main herd. By walking around to the other side of a small ravine they have separated themselves from the herd by the gap between both banks of the ravine. The two herders are playing together in the shade a short distance away and do not notice what is happening. Out of the 25 separated individuals, 6 are from S-herd, 18 are from J-herd; the 25th individual is a sheep from J-herd. There are males and females from both herds in the group. 10:09. The main herd moves further along the opposite side of the ravine and goes down into an adjoining river bed out of sight from the isolated group. The sheep of the isolated group begin to bleat out. 10:12. The goats stop feeding and look over to opposite side of the ravine. One female goat joins in with the sheep and starts bleating. 10:19. The two herders realize what has happened and herd the group across the ravine. Once on the other side the animals run down in the direction of the main herd. 10:23. The stray group rejoins the herds.

In the above case the herder drove the animals out of the situation that they could not figure out on their own. Once out in the open, the goats ran

back towards the herd on their own. In two other instances, the above described behavior was observed in groups of 3 and 8 individuals. In these two instances, the herders did not have to direct the strays back towards the main herd, because there were no obstacles to overcome. In the above observations, when the members of small groups displayed group oriented behavior, members of the main herd made no response what soever.

In any case the group oriented behavior shows that the unity of the domestic goat herd is maintained primarily by the goat themselves. When the members of these groups realized that they had become separated from the herd, they ran to catch up. Therefore it is natural to say that goats gather in herds and herders assist goats in gathering together.

Next, two examples of inter-herd individual relations will be given.

Observation 4. 22 Sept. 1982, 8:43. S-, and J-herd are feeding in the same area but in two distinct groups. 8:51. S-, and J-herd merge and form one group. 8:53. The two herds naturally split back up into two distinct groups. 9:03. Both groups remerge. 10:35. Again the two groups naturally split. 10:55. The groups remerge. 11:56. One herder slaps a few goats on the back with his branch whip calling out "shui". The animals started to move. The two herds naturally split up into two groups, each forming a tight procession, travel back to the settlement. (In none of the above instances of group merging was aggressive behavior observed.)

Observation 5. 29 Nov. 1982, 7:30. The herders take J-herd and S-herd out from the settlement for day-trip herding. 11:00. The individuals from both herds mix together and are feeding as one large group. 11:30. S-, and J-herd naturally split and are moving off in separate directions. At this time 4 individuals from S-herd are left behind in J-herd. These individuals begin bleating. This group consisted of 3 young males and 1 nulliparous female. After a short time lapse, the herders drive both herds back together and these individuals stop bleating.

From Observation 5. it can be seen that there is no cohesiveness between individuals of different herds and that there is cohesiveness between individuals within the same herd. Goats distinguish their own herd from another and have a tendency to keep in contact with their own herd. The goat herd is thus discernible during inter-herd encounters.

It is concluded from these observations that the Samburu goat herd is a sociologically stable unit. First, goats gather in herds and herders assist goats in gathering together. Secondly, constant membership of individuals forms a discernible herd.

DISCUSSION

Characteristics of the goat herd almost identical to that observed in the Samburu, have been observed among the Turkana. The first of all these goats show group oriented behavior, and secondly, herders expend minimal effort in keeping the goats together. According to Ohta (1982), a given individual is under the command of the herder only 3.2 % of its total feeding time. He states that this is sufficient enough to ensure that the animal does not stray. Even among inter-herd relations, the same behaviors described in observations 4 and 5 have been reported for the Turkana (Ohta, 1982). Therefore, the Turkana goat herd is also a sociologically stable group.

However this type of situation observed among domestic goats of the Samburu and Turkana differs from the situation of the feral goats observed by the author on Chichijima (Shikano, in prep.). In Chichijima, there are female home range groups consisting of female with commonable range. Males move beyond these ranges. Female home range group of the feral goat, however, is quite different from that of the female group of the Japanese deer. The latter is a stable congregation (Kawamura, 1957), while the former is not.

The members of one female home range group do not form a single large group, but rather disperse into many small groups. Males also disperse into small groups, and group that consist of both sexes are observed throughout the year. These groups (mean size 3.8) are not formed between specific members, but rather groups were formed and reformed by the fusion and fission of several groups. The only stable bond within these groups was that between the mother and infant. If the mother and infant should be separated during the fission of a group, both individuals display group oriented behavior; bleating towards each other and rejoining. Even the mother-infant bond is severed after approximately six months, at which time mother and infant are frequently observed in separate groups. There are instances when a single individual is separated from the group with which it presently is a member of. This individual will respond with group oriented behavior. However, this does not confirm the existence of stable groups, for the members of the group to which this individual belongs is not constant. Thus the main difference between feral and domestic goats appears to be group stability. There are no stable congregations of feral goats on Chichijima. The same observation is reported among the feral goats of New Zealand (Riney & Caughley, 1959).

According to Schaller (1977), among the wild social Caprinae (Wild Goat, Markhor, Ibex, Urial, Mouflon, etc.) "the herd structure of most species is similar, it being characteristically flexible, with only a mother and her young and sometimes a yearling as well, forming a close bond. Such a loose structure is particularly adaptive in unpredictable environments for it enables herds to adjust their size to the available resources." Perhaps the degree of herd member flexibility is influenced by population density, distribution and quantity of food resources, and predator pressure. There are no reports using the method of individual identification on how the ancestral species of the domestic goat (Wild Goat, Ibex, etc.) form groups. Recognizing the limitations of such reports, it can be conjectured from Schaller's comment that there are no stable congregations in the wild social Caprinae as is also the case in feral goats on Chichijima.

There is no herd with stability in feral and wild goats, the domestic goat herd is stable. Putting this into the context of the origin of pastoral domestic animals the following conclusion can be made. At least as far as goats are concerned, the hypotheses of Imanishi and Umesao are not valid ones. It becomes self-evident that the presupposition, of the existence of a stable herd or one-male group of which man could control and eventually domesticate, is not possible. Consequently, it is necessary to offer a new hypothesis. The author proposes that the stability of the domestic goat herd was formed during the process of domestication with the influence of man. In order to validate this hypothesis, the social structure of the domestic goat must be analysed in great detail and then, the amount of human influence on this structure must be determined.

Lastly, the possible significance of the formation of group stability during the process of domestication must be considered. Suppose for a moment that the goat herd were flexible like that of feral goats. What would happen? If this were so, the herder(s) would have the near impossible task of trying to maintain the unity of the entire herd. The amount of labor necessary to maintain herd unity will greatly increase with the increase in herd size. This will confine the upper limit of the herd size maintainable by a restricted number of people. Under such conditions, the formation of pastoralism as a subsistence base would probably have been impossible. Thus group stability was a necessary step in the process of domestication. Once the goat's social group became stable, it would become possible for a small number of herders to maintain a relatively large herd. In this light, pastoralism as a subsistence base became a thinkable possibility. And then consequently as the irrigation canals on the grassy plains of the Mesopotamia were responsible for the large scale cultivation of wheat, which lead to the

agricultural revolution, the acquisition of group stability in goats can be thought of as a spark that set off the pastoral revolution.

ACKNOWLEDGEMENT

This study was financed by the Scientific Research Fund of the Japanese Ministry of Education, Science, and Culture. I wish to express sincere gratitude to all those who supported me in carrying out this research; to Professor B. E. Kipkorir, the former Director of the Institute of African Studies, University of Nairobi, who accepted me as a research associate during the study period; to Professor J. Tanaka of Hirosaki University, the Director of the Expedition, and to Professor J. Itani of Kyoto University, who encouraged and advised me at every stage of the study.

The greatest appreciation is given to Dr. and Mrs. Sato of Rikkyo University, Mr. I. Ohta of Kyoto University, Professor H. Ishida of Osaka University and expedition members, the staff of Catholic Mission in Maralal, who gave me strong support in the field; and to Mr. M. Huffman also of Kyoto University, who greatly helped in translating this manuscript into English.

Finally, my warmest thanks are to my Samburu friends, especially Mr. Simion Lesiameto and Mr. James Lokumato and their families, who allowed me to live with them and greatly helped me during my stay in their land.

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